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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,345	10/20/2003	Mark Beaumont	DB001066-000	2900
57694	7590	09/05/2007		
JONES DAY 500 GRANT STREET SUITE 3100 PITTSBURGH, PA 15219-2502			EXAMINER KAWSAR, ABDULLAH AL	
			ART UNIT 2109	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/689,345

Applicant(s)

BEAUMONT, MARK

Examiner

Abdullah-Al Kawsar

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2109

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10/20/2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 10/20/2003, 01/07/2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

1. Claims 1-26 are pending.

***Priority***

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No.10/689,345, filed on 10/23/2003.

***Information Disclosure Statement***

3. The information disclosure statement filed 10/20/2003 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

***Specification***

4. The disclosure is objected to because of the following informalities: missing serial numbers and dates in [0044].

Appropriate correction is required.

***Double Patenting***

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 1-26 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9, 12-20 of copending Application No. 10/689336. Although the conflicting claims are not identical, they are not patentably distinct from each other. For instance, claim 1 of copending Application No. 10/689,336 recites the same steps as claim 1 of the present application. The only difference is the substitution of "processing elements linked serially in a line" in the present application with the step of "processing elements arranged in a loop" in copending Application No. 10/689,336. It would have been obvious to one of ordinary skill in the art to use the method in a serially linked processing system. One would

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be motivated by the desire to have a greater variety of choices when performing the claimed load balancing method.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

7. Claims 1-26 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9, 11-20 of copending Application No. 10/689,312. Although the conflicting claims are not identical, they are not patentably distinct from each other. For instance, claim 1 of copending Application No. 10/689,312 recites the same steps as claim 1 of the present application. The only difference is the substitution of "processing elements linked serially in a line" and "calculating local deviation" in the present application with the step of "processing elements arranged in a loop" and "running partial derivation" in copending Application No. 10/689,312. It would have been obvious to one of ordinary skill in the art to use a the method in a serially linked processing system. One would be motivated by the desire to have a greater variety of choices when performing the claimed load balancing method.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

8. Claims 1-26 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9, 12-21 of copending Application No. 10/689,355. Although the conflicting claims are not identical, they are not patentably distinct from each other. For instance, claim 1 of copending Application No. 10/689,355 recites the same

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steps as claim 1 of the present application. The only difference is the substitution of "processing elements linked serially in a line" and "calculating local deviation" in the present application with the step of "processing elements arranged in a loop" and "a sum weighted deviation" in copending Application No. 10/689,355. It would have been obvious to one of ordinary skill in the art to use the method in a serially linked processing system. One would be motivated by the desire to have a greater variety of choices when performing the claimed load balancing method.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

***Claim Rejections - 35 USC § 101***

9. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claims 26 recites a "memory device"; however, it appears that the system would reasonably be interpreted by one of the ordinary skill in the art as software per se failing to be tangibly embodied or included any recited hardware as part of the system.

***Claim Rejections - 35 USC § 112***

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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12. Claims 1-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. The following terms are not clearly understood:

i. Claims 1, 16, and 26 in lines 8-9 recite, "calculating a local mean number of tasks within each of said plurality of processing elements". It is unclear how the local mean number is defined (i.e. is the mean determined over a sampling interval or determined based on the total number of tasks divided by the number of PE's). Line 11 recites, "calculating a local deviation within each of said plurality of processing elements". It is unclear whether the local deviation determination step is performed based on the preceding step.

ii. Claims 5 and 18 recite, "V". It is unclear what is meant by "V". Claims 5 and 18 also recites, "Er". It is unclear how this value is derived for each of the plurality of processing elements. Claim 5 and 18 also recites, "PEr" without providing a definition.

iii. Claims 7 and 20 recite, "wherein Er controls said Trunc function." It is unclear how Er'controls' the function. Furthermore, it is unclear how this step is possible since each Er value is set ahead of time and must be different for each processing element as stated in claims 5 and 18.

iv. Claims 8 and 21 recites, "X and (X+I)". It is unclear what is meant by this. Claims 8 and 21 also recites, "Er" without providing a definition.

***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 1, 2, 4, 9-17 and 22-26 are rejected under 35 U.S.C. 103(a) being unpatentable over "A Simple Load Balancing Scheme for Task Allocation in Parallel Machines"(Rudolph) in view of Smith(Smith) US Patent Publication 2004/0024874 A1.

As per claim 1, Rudolph discloses:

***- a method for balancing the load of a parallel processing system having a plurality of parallel processing elements linked serially in a line with first and second ends, wherein each of said plurality of processing elements has a local number of tasks associated therewith, the method comprising*** ( page 2 col 2 lines 4-6, and lines 9-13 and lines 22-23)

***- determining a total number of tasks present on said line;*** (page 1 col 1 lines 21-24) to determine the average of task means a total number of task is determined.



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*- notifying each of said plurality of processing elements of said total number of tasks*

(page 3 col 1 figure 1 lines 1-5) processing elements balancing the loads inherently means knowing the total number of task.

*- calculating a local mean number of tasks for each of said plurality of processing*

*elements*; (page 1 col 1 lines 21-24) total number of task divided by the number of processor is the mean value of for processors.

*- calculating a local deviation for each of said plurality of processing elements* (page 4

col 1 lines 19-22) finding the difference with the lowest limit(average) is calculating the deviation.

*- redistributing tasks among said plurality of processing elements in response to said*

*first local cumulative deviation and said second local cumulative deviation.* (Page 3 col 1 figure 1 and col 1 lines 19-22) tasks are balanced(redistributed) between processors.

However Rudolph does not disclose , *determining a first local cumulative deviation for each of said plurality of processing elements; determining a second local cumulative deviation for each of said plurality of processing element.s*

On the other hand Smith discloses:

*- determining a first local cumulative deviation for each of said plurality of processing*

*elements; determining a second local cumulative deviation for each of said plurality of processing elements* (page 2 paragraph 0027)

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Therefore, it would have been obvious to a person of ordinary skill in art at the time of invention was made to incorporate the teaching of Smith into the method of Rudolph to have cumulative deviation value. The modification would have been obvious because one of the ordinary skills of the art would implement a cumulative deviation value to determine the difference of tasks between processors for better and faster load balancing with fewer balancing cycle.

As per claim 2, the rejection of claim 1 is incorporated and further Rudolph discloses:

***- wherein said determining a total number of tasks present on said line comprises sequentially summing said local number of tasks associated with each of said plurality of PE's from said first end of said line to said second end of said line. (page 1 col 1 lines 21-24 and col 2 lines 27-30)***

As per claim 4, the rejection of claim 1 is incorporated and further Rudolph discloses:

***- wherein said notifying step includes passing said total number of tasks from said second end to said first end (page 1 col 2 lines 27-30) finding the global average inherently means checking the load throughout the system.***

As per claim 9, the rejection of claim 1 is incorporated and further Rudolph discloses:

***- wherein said calculating a local deviation for each of said plurality of processing elements includes finding the difference between said local number of tasks and said local***

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*mean number of tasks for each PE.sub.r.* (page 4 col 1 lines 19-22) finding the difference with the lowest limit(average) is calculating the deviation.

As per claim 10, the rejection of claim 1 is incorporated and further Smith discloses:

*- wherein said determining a first local cumulative deviation includes sequentially summing said local deviations for each PE.sub.r from said first end of said line to adjacent upstream PE.sub.r-1 on said line.* (paragraph 0038 lines 4-12)

As per claim 11, the rejection of claim 1 is incorporated and further Smith discloses:

*- wherein said determining a second local cumulative deviation includes finding a difference between the negative of said local deviation and said first local cumulative deviation for each PE.sub.r.* (paragraph 0038 lines 4-12)

As per claim 12, the rejection of claim 1 is incorporated and further Smith discloses:

*- wherein said redistributing tasks among said plurality of processing elements comprises: transferring a task from a local PE.sub.r to a left-adjacent PE.sub.r-1 if said first local cumulative deviation for said local PE.sub.r is a negative value; transferring a task from said local PE.sub.r to a right-adjacent PE.sub.r+1 if said second local cumulative deviation for said local PE.sub.r is a negative value.* (Page 2 paragraph 0027 and 0028) bi-directional link between processors and balancing task going both direction means transferring task to the right or left adjacent processor.

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As per claim 13, the rejection of claim 1 is incorporated and further Smith discloses:

*- wherein said redistributing tasks among said plurality of processing elements comprises: transferring a task from a local PE.sub.r to a left-adjacent PE.sub.r-1 if said second local cumulative deviation for said local PE.sub.r is a positive value; transferring a task from said local PE.sub.r to a right-adjacent PE.sub.r+1 if said first local cumulative deviation for said local PE.sub.r is a positive value.* (Page 2 paragraph 0027 and 0028) bi-directional link between processors and balancing task going both direction means transferring task to the right or left adjacent processor.

As per claim 25, the rejection of claim 16 is incorporated and further Smith discloses:

*- wherein said determining a first local cumulative deviation step, determining a second local cumulative deviation step, and said redistributing tasks step continue until said first local cumulative deviation and said second local cumulative deviation for said PE.sub.r is zero* (page 2 paragraph 0027, paragraph 0038 lines 4-12) tasks are redistributed until the system is balanced(zero).

Claims 14, 15 and 16 have similar limitations of claim 1 above. They are therefore rejected under the same rational.

Claims 22 and 23 have similar limitations of claims 10 and 11 above. They are therefore rejected under the same rational.

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Claim 17 has the combined limitations of claims 2 and 4 above. They are therefore rejected under the same rational.

Claim 24 has the combined limitations of claims 12 and 13 above. They are therefore rejected under the same rational.

Claim 26 is a memory device claim of claim 1 above. It is therefore rejected under the same rational.

15. Claims 5, 6, 7, 8, 18, 19, 20 and 21 are rejected under 35 U.S.C. 103(a) being unpatentable over "A Simple Load Balancing Scheme for Task Allocation in Parallel Machines"(Rudolph) in view of Smith(Smith) US Patent Publication 2004/0024874 A1. and in view of Vignes et al.(Vinges) US Patent No. 4,386413.

As per claim 5, Rudolph and smith disclose all the elements of claim 5 except, truncating the mean value.

However Vignes discloses:

*- wherein said calculating a local mean number of tasks for each of said plurality of processing elements further includes solving the equation  $M_{sub.r} = \text{Trunc}((V + E_{sub.r})/N)$ , where  $M_{sub.r}$  represents said local mean for  $PE_{sub.r}$ ,  $N$  represents the total number of processing elements in said line, and  $E_{sub.r}$  is a number in the range of 0 to  $(N-1)$  ( col 1 lines 18-27)*

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Therefore, it would have been obvious to a person of ordinary skill in art at the time of invention was made to incorporate the teaching of Vignes into the method of Rudolph and Smith to truncate the mean value. The modification would have been obvious because one of the ordinary skills of the art would implement a truncated task value for the system to assign a proper number of threads on the system.

As per claim 6, the rejection of claim 5 is incorporated and further Rudolph discloses:

**- wherein each PE has a different E.sub.r value. (figure 1)**

As per claim 7, the rejection of claim 5 is incorporated and further Vignes discloses:

**- wherein E.sub.r controls said Trunc function such that said total number of tasks for said line is equal to the sum of the local mean number of tasks for each of said plurality of processing elements in said line (col 2 lines 36-43)**

As per claim 8, the rejection of claim 5 is incorporated and further Rudolph discloses:

**- wherein said local mean  $M_{sub.r} = \text{Trunc}((V + E_{sub.r}) / N)$  for each local PE.sub.r on said line is equal to one of X and (X+1) (page 4 col 1 lines 37-39) balancing the system with a threshold value(x) means having task value of x and x+1.**

Claims 19 and 20 have similar limitations of claims 6 and 7 above. They are therefore rejected under the same rational.

Claim 18 has the combined limitations of claims 5 and 19 above. They are therefore rejected under the same rational.

Claim 21 has similar limitations of claim 8 above. It is therefore rejected under the same rational.

16. Claim 3 is rejected under 35 U.S.C. 103(a) being unpatentable over “A Simple Load Balancing Scheme for Task Allocation in Parallel Machines”(Rudolph) in view of Smith(Smith) US Patent Publication 2004/0024874 A1. and in view of “Calculus” (Thomas).

As per claim 3, Rudolph in view of Smith discloses all the elements of claim 3 except, *solving the equation  $\sum_{i=0}^{N-1} v_i$ , where  $V$  represents said total number of tasks present on said line,  $N$  represents the number of processing elements in said line, and  $v_{sub.i}$  represents said local number of tasks associated with a local PE.sub.r..*

However Thomas discloses:

*- wherein said determining said total number of tasks present on said line includes solving the equation  $\sum_{i=0}^{N-1} v_i$ , where  $V$  represents said total number of tasks present on said line,  $N$  represents the number of processing elements in said line, and  $v_{sub.i}$  represents said local number of tasks associated with a local PE.sub.r. (page 568)*

Therefore, it would have been obvious to a person of ordinary skill in art at the time of invention was made to incorporate the teaching of Thomas into the method of Rudolph and Smith to solve the equation of average value of the total number of task. The modification would

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have been obvious because one of the ordinary skills of the art would implement a summation equation to solve the mathematical problem.

***Conclusion***

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

TITLE: Method and apparatus of providing a result of a numerical calculation with the number of exact significant figures; US Patent No. 4,386,413.

TITLE: Processor with load balancing; US Patent Publication No. 2004/0024874 A1.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abdullah-Al Kawsar whose telephone number is 571-270-3169.

The examiner can normally be reached on 7:30am to 5:00pm, EST.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chameli Das can be reached on 571-272-3696. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK

  
JEAN M. CORRIELUS  
PRIMARY EXAMINER  
Art unit 2162  
Date 9/4/07